

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	Michael Heuken, <i>et al.</i>
Serial No. 10/	Filing Date: April 16, 2004
Title of Application:	Method And Device For Monitoring A CVD- Process

Mail Stop Non-Fee Amendment  
Commissioner for Patents  
Post Office Box 1450  
Alexandria, VA 22313-1450

**Preliminary Amendment**

Applicants herewith present its amendment and remarks. Please amend the claims as detailed below.

**In the Claims**

1. (Currently Amended) Method for coating at least one substrate (4) with one or more layers in a process chamber (4) in particular of a CVD installation, in which starting materials, in particular in the form of metalorganic reaction gases, are introduced with mass flow control into the process chamber (4), where the starting materials or reaction products thereof are deposited on the substrate (4), which is supported by a temperature-controlled substrate holder (2), in such a manner as to form layers, where the set values for the process parameters (18), such as mass flows of the starting materials and temperature of the substrate holder, are adjusted during a coating cycle, which starts with the loading of the process chamber (4) with the one or more substrates and ends with the removal thereof, in accordance with a predetermined formulation, the actual values for each substrate associated with the set values for the process parameters being determined in an individualized manner at intervals during the coating cycle and stored in a memory, characteristic layer properties (24), such as layer thickness, layer composition, being determined at the layer or at a layer system comprising a plurality of layers during the coating cycle or after each coating cycle or after one or more subsequent processing steps, and being stored such that they are associated with the individualized data for the

associated substrate, the actual values obtained and the layer properties determined for a multiplicity of layers deposited using the same formulation being brought into correlation and correlation values being generated.

2. (Currently Amended) Apparatus for coating at least one substrate with one or more layers in a process chamber in particular of a CVD installation, having feed lines (13) for starting materials, in particular in the form of metalorganic reaction gases, which are introduced with mass flow control (7) into the process chamber (1), where the starting materials or reaction products thereof are deposited on the substrate (4), which is supported by a temperature-controlled substrate holder (2), in such a manner as to form layers, and having a control and memory device (14), the set values for the process parameters, such as mass flows of the starting materials and temperature of the substrate holder, being adjusted in a coating cycle, which starts with the loading of the process chamber (1) with the one or more substrates and ends with the removal thereof, by the control device (15) in accordance with a predetermined formulation which is stored in the memory device (16) and comprises said set values for the process parameters, the actual values for each substrate associated with the set values for the process parameters (18) being determined in an individualized manner at intervals during the coating cycle and being stored in a memory of the memory device, it being possible for characteristic layer properties (21), such as layer thickness, layer composition, which can be determined at the layer or at a layer system comprising a plurality of layers, to be stored, in a form which is associated on an individualized basis with the associated substrate, in a layer property memory of the memory device during or after each coating cycle or after one or more subsequent processing steps, having an analysis device for linking the actual values obtained and the layer properties (21) determined for a multiplicity of layers deposited using the same formulation, in order to generate correlation values, and having a display device for displaying the correlation values (19).

3. (Currently Amended) Method according to Claim 1 ~~or in particular according thereto or apparatus according to Claim 2 or in particular according thereto,~~

characterized in that to generate the correlation values (49) systematic or statistical deviations of the set values from a mean set value or the associated actual values are formed.

4. (Currently Amended) Method or apparatus according to claim 1 ~~one or more of the preceding claims or in particular according thereto~~, characterized in that to generate the correlation values (49) mean values are formed from the actual values (48) of each coating cycle, and deviations from the mean values are generated.

5. (Currently Amended) Method or apparatus according to claim 1 ~~one or more of the preceding claims or in particular according thereto~~, characterized in that correction values which are applied to the actual values of the formulation are determined from the correlation values.

6. (Currently Amended) Method or apparatus according to claim 1 ~~one or more of the preceding claims or in particular according thereto~~, characterized in that the formulation includes stipulations concerning certain layer properties, for example the layer thickness, and during a process step this layer property is measured in situ, and the step is ended when a set value provided in the formulation for this layer property is reached.

7. (Currently Amended) Method or apparatus according to claim 1 ~~one or more of the preceding claims or in particular according thereto~~, characterized in that the correlation values generated are graphic representations (20) of the temporal profiles of the actual values (48), which are placed in a relationship with the characteristic layer properties (24).

8. (Currently Amended) Method or apparatus according to claim 1 ~~one or more of the preceding claims or in particular according thereto~~, characterized in that the set values for the process parameters are provided by an electronic control device to decentralized regulators, such as mass flow regulators (7) or temperature regulators

(10), and the actual values are fed back by actual value pick-ups, associated with the regulators, to the electronic control device (15).

9. (Currently Amended) Method or apparatus according to claim 1 ~~one or more of the preceding claims or in particular according thereto~~, characterized in that the process parameters are also the valve positions of the valves (9) of a gas supply system (6), the temperature of liquid metalorganic sources (8), the rotational speed and the temperature of a substrate holder (2) which carries a plurality of substrates (4) and substrate temperatures which can be associated with each substrate individually.

10. (Currently Amended) Method or apparatus according to claim 1 ~~one or more of the preceding claims or in particular according thereto~~, characterized in that, in addition to the actual values for the process parameters, process properties which are determined at intervals during the coating cycle, such as substrate temperature, rotational speed of the substrate, growth rate of the layer and/or surface properties of the layer, are stored and brought into correlation with the layer properties.

11. (Currently Amended) Method or apparatus according to claim 1 ~~one or more of the preceding claims or in particular according thereto~~, characterized in that the sequence of the set values stored in the formulation (17) is subjected to a plausibility check prior to a coating cycle.

12. (Currently Amended) Method or apparatus according to claim 1 ~~one or more of the preceding claims or in particular according thereto~~, characterized in that the plausibility check is carried out as a coating cycle which is simulated in the control device and during which the set values are provided to virtual regulating and actuating elements which feed back virtually generated actual values.

13. (Currently Amended) Method or apparatus according to claim 1 ~~one or more of the preceding claims or in particular according thereto~~, characterized in that

environment-related properties, such as ambient air humidity, ambient air temperature and ambient air purity, are stored at intervals on an individualized basis for each substrate and are brought into correlation with the layer properties.